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# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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# Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 492)*

MAY 31, 1999

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### LIFE SCIENCES (GENERAL)

**19990036001** Tulane Univ., Dept. of Microbiology and Immunology, Covington, LA USA

**Construction of a Specialized Cloning Strain of E. Coli for the Nitrate Reductase Genes of Haloferax Denitrificans** *Final Report, 1 Nov. 1993 - 31 Oct. 1998*

Johnson, Emmett, Tulane Univ., USA; Feb. 08, 1999; 4p; In English

Contract(s)/Grant(s): NCC2-5011; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This is the final report on Joint Research Interchange (NCC2-5011) "Construction of a Specialized Cloning Strain of E. coli for the Nitrate Reductase Genes of Haloferax denitrificans." Originally the award was 11/1/93-10/31/95, but there were no-cost extensions made, because of a year Sabbatical at the Pasteur Institute in Paris and other leaves of 3 months each at the Pasteur Institute, during which work could not be done on this project, which extended the closing date to 10/30/98.

Derived from text

*Cloning (Biology); Escherichia; Genes; Costs*

**19990036053** Alberta Univ., Dept. of Earth and Atmospheric Sciences, Edmonton, Alberta Canada

**Microbial Experiments on Basal Ice From John Evans Glacier, Eastern Ellesmere Island, Northwest Territories, Canada**

Skidmore, M., Alberta Univ., Canada; Foght, J., Alberta Univ., Canada; Sharp, M., Alberta Univ., Canada; The First International Conference on Mars Polar Science and Exploration; 1998, pp. 34-35; In English; See also 19990036014; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

Recent research on permanent-ice associated microorganisms has focused on surficial ice environments. We present evidence that, to the authors' knowledge, is the first example that aerobic and anaerobic bacteria can be cultured at 4 C from sediment-rich basal ice from a large polythermal Arctic glacier (John Evans Glacier). This builds on previous work in which we demonstrated that both aerobic and anaerobic microbes exist in viable populations in subglacial meltwaters at the same glacier, and that the populations increase with sediment concentration. This high Arctic glacier (at 80 degrees N) may be a reasonable terrestrial analog for martian polar environments, and hence the findings of this study may be important in assisting sampling program development for microbiology in the martian polar regions.

Author

*Aerobes; Anaerobes; Arctic Regions; Glaciers; Ice Environments; Mars (Planet); Mars Surface; Microbiology; Sampling; Exobiology*

**19990036479** Department of Energy, Office of Energy Research, Washington, DC USA

**Hemicellulases from the ethanologenic thermophile, Thermoanaerobacter ethanolicus and related anaerobic thermophiles** *Final Report, Sep. 1992 - Jun. 1996*

Wiegel, J., Department of Energy, USA; Dec. 31, 1998; 12p; In English

Report No.(s): DE98-007377; DOE/ER/20199-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The short term goals of this application were to characterize hemicellulases from anaerobic thermophiles on the biochemical and molecular level to extend the presently limited knowledge of hemicellulases in anaerobic thermophilic bacteria. This objective includes the following tasks: (1) Traditional purification and biochemical/biophysical characterization of xylanases from the newly isolated, slightly alkali-tolerant strain NDF190, and the slightly acid-tolerant strain YS485, both with high xylanolytic activities, and of the 4-O-methyl glucuronidase and arabinosidase from strain NDF190 and the acetyl (xylan) esterase from T. ethanolicus. This also includes determining the N-terminal sequences and obtaining gene probes. (2) Elucidation of the regulation of hemicellulolytic enzymes in anaerobic thermophiles. (3) to clone into E. coli and identify the multiplicity of the enzymes involved

in hemicellulose degradation by *T. ethanolicus* and other suitable organisms. (4) To purify and characterize the recombinant enzymes with the goal of identifying the best enzymes for cloning into the ethanogenic *T. ethanolicus* to obtain an optimized hemicellulose utilization by this bacterium.

NTIS

*Thermophiles; Anaerobes; Molecules; Biochemistry*

**19990036521** Department of Energy, Office of Energy Research, Washington, DC USA

**Stoichiometric relationship between the (Mn)4-cluster and PSII Ca(2+) necessary for O<sub>2</sub>-evolution** *Final Report*

Dec. 31, 1998; 9p; In English

Report No.(s): DE99-000257; DOE/ER/13533-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report focuses on the following research accomplishments: Stoichiometric relationship between the (Mn)<sub>4</sub>-cluster and PSII Ca(2+) necessary for O<sub>2</sub>-evolution; Photodamage of Mn-depleted PSII membranes: Sites and mechanisms of photoinactivation of primary reactions; The photoassembly of the PSII (Mn)<sub>4</sub>-cluster is modulated by Ca(2+) and DCIP; The natural product sorgoleone inhibits electron transfer at the Q(sub A) /Q(sub B) site of PSII; and Photodamages of Ca(2+)-depleted PSII membranes: Sites and mechanisms of inactivation of donor side reactions.

NTIS

*Stoichiometry; Atomic Clusters; Oxygen; Calcium Isotopes; Manganese; Chemical Evolution*

**19990036544** Department of Energy, Assistant Secretary for Management and Administration, Washington, DC USA

**Nonlinear Analysis of Biological Sequences**

Torney, D. C., Department of Energy, USA; Bruno, W., Department of Energy, USA; Detours, V., Department of Energy, USA; Dec. 31, 1998; 13p; In English

Report No.(s): DE99-000818; LA-UR-98-2091; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the final report of a three-year, Laboratory Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). The main objectives of this project involved deriving new capabilities for analyzing biological sequences. The authors focused on tabulating the statistical properties exhibited by Human coding DNA sequences and on techniques of inferring the phylogenetic relationships among protein sequences related by descent.

NTIS

*Research and Development; Deoxyribonucleic Acid; Proteins*

**19990036545** Department of Energy, Assistant Secretary for Management and Administration, Washington, DC USA

**Structure, Dynamics, and Function of Biomolecules**

Frauenfelder, H., Department of Energy, USA; Berendzen, J. R., Department of Energy, USA; Garcia, A., Department of Energy, USA; Gupta, G., Department of Energy, USA; Olah, G. A., Department of Energy, USA; Dec. 31, 1998; 10p; In English

Report No.(s): DE99-000817; LA-UR-98-2093; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the final report of a three-year, Laboratory Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). The authors enhanced Los Alamos' core competency in Bioscience and Biotechnology by building on present strengths in experimental techniques, theory, high-performance computing, modeling, and simulation applied to biomolecular structure, dynamics, and function. Specifically, the authors strengthened their capabilities in neutron/x-ray scattering, x-ray crystallography, NMR, laser, and optical spectroscopies. Initially they focused on supporting the Los Alamos' Neutron Science Center (LANSCE) in the design and implementation of new neutron scattering instrumentation, they developed new methods for analysis of scattering data, and they developed new projects to study the structures of biomolecular complexes. The authors have also worked to strengthen interactions between theory and experiment, and between the biological and physical sciences. They sponsored regular meetings of members from all interested LANL technical divisions, and supported two lecture series: 'Biology for Physicists' and 'Issues in Modern Biology'. They also supported the formation of interdisciplinary/inter-divisional teams to develop projects in science-based bioremediation and an integrated structural biology resource. Finally, they successfully worked with a multidisciplinary team to put forward the Laboratory's Genome and Beyond tactical goal.

NTIS

*Research and Development; Molecular Biology; Biotechnology; Biochemistry*



**19990036547** Department of Energy, Assistant Secretary for Management and Administration, Washington, DC USA

**Covariation of Mutations: A Computational Approach for Determination of Function and Structure from Sequence**

Haussler, D., Department of Energy, USA; Hughey, R., Department of Energy, USA; Karplus, K., Department of Energy, USA; Cline, M., Department of Energy, USA; Grate, L., Department of Energy, USA; Dec. 31, 1998; 13p; In English  
Report No.(s): DE99-000809; LA-UR-98-2180; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The authors have developed and enhanced a set of tools for fold recognition with hidden Markov models (HMMs), and used these tools effectively in the CASP2 protein structure prediction contest (KKB+97). HMMs have limitations, and one limitation is that they do not model the long-range pairwise interactions that define the shape of a protein. As such, the authors are working on modeling pairwise interactions to incorporate them into the HMM-based framework. Classical fold recognition methods are based on the premise of distinct pairwise preferences between two given amino acids. The authors have studied these preferences extensively and found that in the general case, this information is limited. Yet by modeling pairwise interactions in context of phylogenetic relationships and by modeling one specific type of contact, the contact between interacting beta strand residues, they have recovered significant information for prediction and analysis of protein structure.

NTIS

*Proteins; Amino Acids; Structural Analysis*

**19990036614** Department of Energy, Assistant Secretary for Management and Administration, Washington, DC USA

**Sum frequency generation studies of membrane transport phenomena**

Dyer, R. B., Department of Energy, USA; Shreve, A. P., Department of Energy, USA; Dec. 31, 1998; 14p; In English  
Report No.(s): DE99-000841; LA-UR-98-1831; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the final report of a three-year, Laboratory Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). The objective of this work is to study the transport of protons and ions across biological membranes, one of the most fundamental processes in living organisms, critical for energy transduction in respiration and photosynthesis and for a wide variety of cellular signal transduction events. Membrane protein structure and function, in particular proton and ion pumping are poorly understood. The authors have developed sum frequency generation (SFG) spectroscopy for the study of membrane phenomena, a nonlinear spectroscopic technique that is uniquely sensitive to interfaces and with demonstrated structural specificity. They have used SFG and conventional vibrational spectroscopic approaches to study proton transport processes in cytochrome c oxidase. A key finding has been the identification of vibrational modes associated with proton labile groups, including a glutamic acid near the redox active binuclear center and structural waters. These groups are sensitive to the ligation and redox states of the metal centers and hence are ideal candidates for coupling redox energy to proton transport processes.

NTIS

*Protons; Ions; Membranes; Spectroscopic Analysis; Membrane Structures; Transport Properties; Molecular Structure*

**19990036671** Department of Energy, Office of Energy Research, Washington, DC USA

**Molecular Analyses of Nuclear-Cytoplasmic Interactions Affecting Plant Growth and Yield Final Report**

Newton, K. J., Department of Energy, USA; Dec. 31, 1998; 5p; In English  
Report No.(s): DE99-000723; DOE/ER/20036-T2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Mitochondria have a central role in the production of cellular energy. The biogenesis and functioning of mitochondria depends on the expression of both mitochondrial and nuclear genes. One approach to investigating the role of nuclear-mitochondrial cooperation in plant growth and development is to identify combinations of nuclear and mitochondrial genomes that result in altered but sublethal phenotypes. Plants that have certain maize nuclear genotypes in combination with cytoplasmic genomes from more distantly-related teosintes can exhibit incompatible phenotypes, such as reduced plant growth and yield and cytoplasmic male sterility, as well as altered mitochondrial gene expression. The characterization of these nuclear-cytoplasmic interactions was the focus of this grant. The authors were investigating the effects of two maize nuclear genes, RcmI and Mct, on mitochondrial function and gene expression. Plants with the teosinte cytoplasm and homozygous for the recessive rcm allele are small (miniature) and slow-growing and the kernels are reduced in size. The authors mapped this locus to molecular markers on chromosome 7 and attempted to clone this locus by transposon tagging. The effects of the nuclear-cytoplasmic interaction on mitochondrial function and mitochondrial protein profiles were also studied.

NTIS

*Plants (Botany); Vegetation Growth; Mitochondria; Cytoplasm*

52  
**AEROSPACE MEDICINE**

*Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.*

**19990035829** Mount Sinai School of Medicine, New York, NY USA

**Hormonal Replacement Therapy for Breast Cancer Survivors: A Decision Analysis** *Annual Report, 15 Jul. 1997 - 14 Jul. 1998*

Sacks, Henry S.; Aug. 1998; 9p; In English

Contract(s)/Grant(s): DAMD17-97-1-7199

Report No.(s): AD-A360957; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goals of this project are to develop a computerized decision analysis model concerning the risks and benefits of hormone replacement therapy for breast cancer survivors. During the first year, we updated our literature search and review and found numerous studies relevant to our question. We developed a pilot instrument to measure patient preferences, but found that this did not provide useful information. We have begun construction of two alternative decision analysis models. During the next year we plan to continue development of the model. Because of the complexities of developing valid instruments for measuring patient preferences (utilities), we have rearranged our budget to permit us to obtain the consultative services of Dr. Albert Wu of John Hopkins University, an authority on measurement of quality of life.

DTIC

*Hormones; Computer Techniques; Cancer; Models; Mammary Glands; Computer Aided Design*

**19990035868** Department of Energy, Washington, DC USA

**Computer-based and web-based radiation safety training**

Owen, C., Department of Energy, USA; Mar. 01, 1998; 14p; In English; 1998 Health Physics Society Summer School Management and Administration of Radiation Safety Programs, 1998, USA

Report No.(s): DE98-058864; UCRL-JC-130376; CONF-980755; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The traditional approach to delivering radiation safety training has been to provide a stand-up lecture of the topic, with the possible aid of video, and to repeat the same material periodically. New approaches to meeting training requirements are needed to address the advent of flexible work hours and telecommuting, and to better accommodate individuals learning at their own pace. Computer-based and web-based radiation safety training can provide this alternative. Computer-based and web-based training is an interactive form of learning that the student controls, resulting in enhanced and focused learning at a time most often chosen by the student.

NTIS

*Radiation Protection; World Wide Web; Computer Assisted Instruction*

**19990036009** Istituto Superiore di Sanita, Rome, Italy

**Biomonitoring of Human Populations Exposed to Petroleum Fuels with Special Consideration of the Role of Benzene as a Genotoxic Component** *Monitoraggio Biologico di Popolazioni Esposte a Carburanti, Con Particolare Riguardo Agli Effetti del Benzene*

Carere, A., Editor, Istituto Superiore di Sanita, Italy; Crebelli, R., Editor, Istituto Superiore di Sanita, Italy; Dec. 1997; ISSN 0394-9311; In English

Contract(s)/Grant(s): CEC-EV5V-CT92-0221

Report No.(s): ISS-97/4; Copyright; Avail: Issuing Activity (Istituto Superiore di Santa, Viale Regina Elena, 299-00161, Rome, Italy), Hardcopy, Microfiche

In the framework of an EC research programme on the health risks of environmental chemicals, the Istituto Superiore di Sanita co-ordinated, in 1993-1996, a projection the biological effects of benzene and petroleum fuels. Seven laboratories from six European countries collaborated in the biological monitoring of selected populations with occupational exposure to petrochemicals. Several markers of early biological effect were applied together with environmental and personal exposure monitoring techniques. An epidemiological retrospective mortality study was also carried out on Italian filling station attendants. The results obtained highlighted an excess of genetic damage in some of the study populations, compared to matched unexposed controls. Even though these results do not allow a reliable risk estimation, the possible prognostic significance of cytogenetic damage for

future cancer onset, together with some alerting findings from the mortality study, suggest that low dose exposures to benzene and petroleum fuels may retain some toxicological significance.

Author

*Biological Effects; Environmental Monitoring; Benzene; Crude Oil; Fuels; Damage*

**19990036078** Strang Cancer Prevention Center, New York, NY USA

**Statistical Methods for Analyzing Time-Dependent Events in Breast Cancer Chemoprevention Studies** *Annual Report, 30 Sep. 1997 - 29 Sep. 1998*

Wong, George Y.; Oct. 1998; 15p; In English

Contract(s)/Grant(s): DAMD17-94-J-4332

Report No.(s): AD-A360834; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overall aim of our research proposal is the statistical nonparametric inference of the redistribution-to-the-center estimator (RTCH) and the generalized maximum likelihood estimator (GMLE) for the survival function of a time-to-event variable that is subject to interval censoring. The RTCH, which is proposed by us, has a closed-form expression and is equal to the GMLE under a homogeneous condition. The GMLE is the standard optimal estimator in survival analysis. However, it cannot be expressed in a closed-form expression, and asymptotic distribution theory for it has been limited. From the asymptotic study of the RTCH, we have gained important insight into proofs of asymptotic properties of the GMLE. In the past four years we have established consistency, asymptotic normality and asymptotic efficiency of the GMLE under a variety of conditions. In addition, we have derived an asymptotic nonparametric two-sample distance test procedure for comparing two populations. Finally, we have begun investigating the asymptotic inference of Cox regression model for interval-censored data by establishing consistency and asymptotic normality of the GMLE of the regression parameters under some finite assumptions. These preliminary results are being applied to a breast cancer prognostic relapse follow-up study.

DTIC

*Chemotherapy; Survival; Statistical Analysis; Regression Analysis; Cancer; Mammary Glands; Maximum Likelihood Estimates*

**19990036079** Naval Medical Research Inst., Bethesda, MD USA

**Statistically Based Decompression Tables 11: Manned Validation of the LE Probabilistic Model for Air and Nitrogen-Oxygen Diving, May 1991 - May 1993**

Thalmann, E. D.; Kelleher, P. C.; Survanshi, S. S.; Parker, E. C.; Weathersby, P. K.; Feb. 1999; 83p; In English

Contract(s)/Grant(s): Proj. M0099

Report No.(s): AD-A360867; NMRC-99-01; NEDU-TR-1-99; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This first-ever validation trial of a probabilistic decompression algorithm was conducted from 1991-92. A real time computer algorithm updated subjects' optimal decompression schedule within a numerical specification of the acceptable risk of decompression sickness (DCS). Long dives (majority over 6 hours) were chosen for testing because of operational needs and under-representation in the calibration data set: long repetitive air dives and multi-level dives - with air throughout, or with 0.7 ATA O<sub>2</sub> during shallow transits or during the final decompression. Non-acclimatized divers wearing wet suits were immersed, chilled, and performed moderate exercise on the bottom but rested during decompression. A total of 730 dives resulted in 36 DCS cases, and another 20 cases with marginal symptoms. A subset (158 dives) were performed with the Combat Swimmer Multi-level Dive procedure, demonstrating greater safety when shallow transits were taken at 15 than at 30 feet of seawater. Overall the model was a predictive success: on none of the profiles were observed DCS incidence outside statistical uncertainty, and optimal model parameters were not greatly changed by the addition of the trial data. The real time algorithm is reliable enough for general Navy use.

DTIC

*Statistical Analysis; Tables (Data); Algorithms; Decompression Sickness; Pressure Reduction*

**19990036126** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Women at Altitude: Voluntary Muscle Exercise Performance with and Without  $\alpha$ -Adrenergic Receptor Blockage**

Fulco, C. S.; Muza, S. R.; Rock, P. B.; Matthews, A.; Kambis, K. W.; Feb. 1999; 28p; In English

Report No.(s): AD-A360458; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is not clear if women, like men, have impaired muscle endurance performance during initial altitude exposure or if increased sympathetic activation is essential to mediate the many physiological responses and adjustments that characterize longer altitude exposures. To study these issues, 14 healthy women (22±2 yr) were randomly assigned to receive either 2 mg prazosin (n=7) or placebo (n=7) t.i.d. (double-blind design) for 12d at sea level (SL) and during the first 12d of HA residence (4300 m). Moreover, no statistically significant differences were detected between groups for any measure on any test day. These findings indicate that:

1. small muscle endurance exercise performance of women, unlike that of men, is not impaired during initial altitude exposure,

and 2. pharmacological blocking of 1-adrenergic receptors during altitude acclimatization does not result in a meaningful change in either muscle exercise performance or in cardiopulmonary function during isolated muscle exercise.

DTIC

*Altitude Acclimatization; Exposure; Females; Heart Function; Muscular Function; Physical Exercise; Physiological Responses; Fatigue (Biology)*

**19990036682** Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

**An Investigation Into the Noninvasive Assessment of Bone Density Using Multiplexed Compton Scattered Tomography**

Sands, Marc J.; Mar. 08, 1999; 94p; In English

Report No.(s): AD-A361485; AFIT/GAP/ENP/99M-10; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this research is to investigate the application of a Compton scatter imaging technique to measure bone density. A demonstration Multiplexed Compton Scatter Tomograph (MCST) was assembled to demonstrate the feasibility of detecting osteoporosis by modifying a system originally designed to detect hidden corrosion in aluminum aircraft wings. Measurements were performed on an aluminum phantom representing a wrist bone containing varying densities in the center and varying thickness of the cortical shell. The densities in the center are comparable to normal trabecular bone, sixty-percent of normal trabecular bone and a void. The MCST images of the phantom were then compared to simulated images from a detector. The images and simulations were also compared to images from a clinical computed tomography (CT) scanner. Based on the results, the MCST can discern the features represented by the trabecular bone. The system was able to differentiate normal, osteoporotic and void densities.

DTIC

*Density; Bones; Imaging Techniques; Multiplexing; Compton Effect*

**19990036746** Army Aeromedical Research Lab., Fort Rucker, AL USA

**Heat Stress Evaluation of Special Operations Aviation Regiment and Air Warrior Concept 1 and 3 Aviator Ensembles in a UH-60 Simulator Final Report**

Reardon, Matthew J.; Katz, Lawrence; Frazer, Beth; Mar. 1999; 76p; In English

Contract(s)/Grant(s): Proj-30162787A879

Report No.(s): AD-A361526; USAARL-99-07; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This aviator heat stress study used a mixed between/within test subject design with one environmental condition (hot) and three rotary-wing MOPP4 ensembles (Special Operations Aviation Regiment SOAR), Air Warrior Concept 1, and Air Warrior Concept 3) encumbered with ballistic protection and over-water survival components. The SOAR ensemble was tested with (SC) and without (SX) microclimate cooling (MCC) consisting of a water-cooled undershirt with portable refrigerator/pump. Air Warrior Concept 1 and Concept 3 aviator MOPP4 ensembles were tested with (AC) and without (AX) MCC, respectively. Physiological and subjective data were obtained to compare thermoregulatory responses and quantitate the benefits of microclimate cooling. Test sessions consisted of a 20-minute treadmill walk in a heated (100 deg F and 20 percent relative humidity RH) environmental chamber to stimulate outdoor preflight activities, followed by three 2-hour sorties in a research UH-60 simulator with cockpit conditions set at 1000 F and 50 percent RH (90 deg F wet-bulb globe temperature WBGT).

DTIC

*Atmospheric Temperature; Microclimatology; Liquid Cooling; Heat Tolerance; Cockpits; Aircraft Pilots*

**19990036773** NASA Langley Research Center, Hampton, VA USA

**Aerospace Medicine and Biology: A Continuing Bibliography with Indexes, Supplement 490**

May 03, 1999; 34p; In English

Report No.(s): NASA/SP-1998-7011/SUPPL490; NAS 1.21:7011/SUPPL490; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This supplemental issue of Aerospace Medicine and Biology, A Continuing Bibliography with Indexes (NASA/SP-1999-7011) lists reports, articles, and other documents recently announced in the NASA STI Database. In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive



appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. Two indexes-subject and author are included after the abstract section.

CASI

*Aerospace Medicine; Bibliographies; Exobiology; Indexes (Documentation); Biological Effects*

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### BEHAVIORAL SCIENCES

*Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.*

**19990032480** Advisory Group for Aerospace Research and Development, Human Performance Modelling Working Group, Neuilly-Sur-Seine, France

**[Overview of the Guide to Human Performance Modeling]**

A Designer's Guide to Human Performance Modelling; December 1998, pp. 1-33; In English; See also 19990032479; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This report is comprised of Chapters 1 through 7 of the Designer's Guide to Human Performance Modeling, presented by Working Group-22 as a joint effort between the Flight Vehicle Panel and the Aerospace medical Panel of AGARD. Chapter 1 of the Designer's Guide presents a brief description and the current status of Human Performance Modeling followed by an outline of the organization of the report as a whole. The remaining chapters, 2 through 7 discuss the following topics: 1) Applications of HPM's (Human Performance Models); 2) Taxonomy of Models; 3) Model Limitations; 4) Implementation Issues; 5) Description of the Expert System; and 7) Recommendations for future work.

CASI

*Human Performance; Complex Systems; Systems Engineering; Models*

**19990032481** Defence Evaluation Research Agency, Centre for Human Sciences, Farnborough, UK

**Worked Example of the use of IPME in the Evaluation of System Effectiveness**

Belyavin, Andy, Defence Evaluation Research Agency, UK; A Designer's Guide to Human Performance Modelling; December 1998, pp. A1-1 - A1-16; In English; See also 19990032479; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The Integrated Performance Modelling Environment (IPME) programme was established in 1995 in the UK Ministry of Defence Corporate Research Programme (CRP) under TG5 with the objective of developing a methodology for quantifying the human performance to system effectiveness. The approach adopted to meeting this requirement, was to develop a software framework based on earlier US work, which would permit the description of the human interaction with the system and the environment based on a task analysis approach. The software framework provides the means to simulate the interaction between man and system based on a task network logic flow.

Derived from text

*System Effectiveness; Human Performance; Models; Man Machine Systems; Systems Engineering; Human Factors Engineering; Computer Systems Design*

**19990032482** Roke Manor Research Ltd., Romsey, UK

**Worked Example of the use of PUMA in a Function Allocation Task**

Day, P., Roke Manor Research Ltd., UK; A Designer's Guide to Human Performance Modelling; December 1998, pp. A2-1 - A2-5; In English; See also 19990032479; Copyright Waived; Avail: CASI; A01, Hardcopy; A02, Microfiche

The PUMA method and toolset was used in an allocation of function study, involving the reengineering of a major civil Air Traffic Control system. As is the case in advanced, process-control like systems, one of the major issues facing designers is the extent to which functions formerly undertaken by humans in the system may usefully be automated. In the case of ATC systems, safety remains the paramount consideration, but there is also a growing requirement to increase system throughput as the levels of civil air traffic continue to grow. For this reason, civil aviation authorities around the world are increasing their level of investment in ATC systems, and in many cases replacing obsolete systems with new technology. ATC remains however a human-centered control activity, a situation that is unlikely to change in the foreseeable future, and hence one of the major issues that faces designers is the extent to which system functions may usefully be delegated to computer control while still keeping the human

firmly in the loop. The study described was undertaken in this context, and is an illustration of the use of the PUMA method and toolset for the purposes of task analysis and workload estimation, thus enabling decisions on functional allocation to be taken.

Derived from text

*Systems Engineering; Air Traffic Control; Control Systems Design; Tasks; Workloads (Psychophysiology)*

**19990032486** British Aerospace Public Ltd. Co., Sowerby Research Centre, Filton, UK

**Worked Example of the Oracle Target Acquisition Model**

Emmerson, P., British Aerospace Public Ltd. Co., UK; A Designer's Guide to Human Performance Modelling; December 1998, pp. A6-1 - A6-14; In English; See also 19990032479; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The following description makes up the problem space for the Target Acquisition Model. A designer is asked to provide a human operator with optimised values for the gain on an electro-optical sensor system in a land fighting vehicle. The gain (or 'temperature window') is known to affect target acquisition, and the designer decides to issues guidelines for the optimum gain for specific situations, based on predictions from a human visual target acquisition model. The chosen model, ORACLE, predicts target acquisition performance under a wide range of conditions, and can include performance with a variety of sensors. For this example, the thermal imaging model is used, in which a single parameter (gain) is iterated over a realistic range for the TI, for a single scenario (a given target and environmental conditions). A complete solution to the designers requirement would involve iterations over other variables (for example different atmospheric visibilities), but all such iterations would follow the procedure outlined). It is to be noted that this example has been chosen to show the potentially wide range of input parameters that can be used. The remainder of the report is made up of the process description, input/outputs from the case study, solution description and facility/resource requirements.

Derived from text

*Target Acquisition; Models; Electro-Optics; Performance Prediction*

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### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

*Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.*

**19990032479** Advisory Group for Aerospace Research and Development, Human Performance Modelling Working Group, Neuilly-Sur-Seine, France

**A Designer's Guide to Human Performance Modelling *La Modelisation des Performances Humaines: Manuel du Concepteur***

A Designer's Guide to Human Performance Modelling; December 1998; 170p; In English; See also 19990032480 through 19990032490

Report No.(s): AGARD-AR-356; ISBN 92-836-1077-6; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

Working Group 22 was convened in 1995, jointly sponsored by the Aerospace Medical Panel and the Flight Vehicle Panel to investigate the use of Human Performance Models within the specification, procurement, design, qualification and certification of military systems. In particular the group focused on the selection, application and use of HPMs by the system designer. An expert system approach was selected to ensure that the designer considered all the relevant factors when selecting a new model or tool. This was implemented using a commercially available expert system shell. The user is asked to select options that most closely describe his resources and requirements and the Human Operator Modelling Expert Review (HOMER) then rank-orders the HPMs in its database and suggests the most appropriate model. The group carried out some walkthroughs of existing models/tools to demonstrate typical uses in the analysis of specific issues. These are included as case studies. These were included to give potential users some insight into the ease or complexity of use in order to evaluate the required aspect of human performance. In addition the group also considered the model developer community by examining the limitations of existing models, commercial implications and usability issues in order to guide any future development.

Author

*Human Performance; Expert Systems; Models; Human Factors Engineering; Man Machine Systems; Systems Engineering; Operations Research*

**19990032483** Defence Evaluation Research Agency, Aircraft Test and Evaluation, Boscombe Down, UK

**Application of an Anthropometric Tool to Cockpit Layout**

Burrett, Gretchen, Defence Evaluation Research Agency, UK; A Designer's Guide to Human Performance Modelling; December

1998, pp. A3-1 - A3-4; In English; See also 19990032479; Copyright Waived; Avail: CASI; A01, Hardcopy; A02, Microfiche

Anthropometric tools are used to assess human interaction with workplace layout in terms of fit, reach and vision. As humans do not come in a standard size, these tools address the range of potential users, from very small to very large. This paper provides an example of how Anthropometric tools can be used to help optimise cockpit layout. Jack(R) is used as an example tool.

Author

*Anthropometry; Cockpits; Optimization; Computer Aided Design*

**19990032484** GEC-Marconi Research Centre, Great Baddow, UK

**Human Reliability Assessment Tools: PHRASE 2**

Buck, Brian, GEC-Marconi Research Centre, UK; Burrett, Gretchen, GEC-Marconi Research Centre, UK; A Designer's Guide to Human Performance Modelling; December 1998, pp. A4-1 - A4-5; In English; See also 19990032479; Copyright Waived; Avail: CASI; A01, Hardcopy; A02, Microfiche

Human Reliability Assessment (HRA) tools seek to quantify the likelihood of human error given that error mechanisms have been identified. They form an integral part of a larger process of Human Reliability Assessment. HRA has traditionally been used primarily in the process control industries, but some methods are appropriate to military applications. Its use requires skilled practitioners. HRA is not a substitute for detailed human factors assessment when the objective is to maximise human performance. However, it will assist in directing design and evaluation effort where the human contribution is most critical. This paper outlines how HRA tools can be applied to cockpit design and describes the HRA process. PHRASE 2 is used as an example tool.

Author

*Human Factors Engineering; Pilot Error; Pilot Performance; Reliability; Assessments*

**19990032485** Honeywell Technology Center, Minneapolis, MN USA

**Case Study Involving FAIT**

Riley, Victor, Honeywell Technology Center, USA; A Designer's Guide to Human Performance Modelling; December 1998, pp. A5-1 - A5-14; In English; See also 19990032479; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This document describes in detail the capabilities of Honeywell's Function Allocation Issues and Tradeoffs (FAIT) methodology, its assumptions and philosophy, methods of use, and types and utility of output. This case studies illustrates the process and applicability of FAIT in evaluating the potential human factors issues inherent in a proposed piece of aircraft automation: a new implementation of data link technology.

Author

*Human Factors Engineering; Systems Engineering; Complex Systems; Data Links; Man Machine Systems; Air Traffic Control; Decision Support Systems*

**19990032487** Honeywell Technology Center, Minneapolis, MN USA

**Case Studies Involving W/Index**

Miller, Christopher A., Honeywell Technology Center, USA; A Designer's Guide to Human Performance Modelling; December 1998, pp. A7-1 - A7-9; In English; See also 19990032479

Contract(s)/Grant(s): DAAJ02-92-R-0037; DAAA15-89-C-0021; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

This document describes in detail the capabilities of Honeywell's Workload Index (W/Index) tool, its assumptions and philosophy, methods of use, and types and utility of output. Two case studies are provided to illustrate the process and applicability of workload prediction using W/Index: (1) an example evaluating crew station layout and functionality in an advanced attack/scout helicopter domain, and (2) an example evaluating alternate methods of crew reduction through added automation in an existing tank.

Author

*Workloads (Psychophysiology); Computerized Simulation; Crew Workstations; Man Environment Interactions*

**19990032488** Micro Analysis and Design, Boulder, CO USA

**Worked Example of the Use of WINCREW in the Evaluation of Overall System Performance**

Laughery, R., Jr., Micro Analysis and Design, USA; A Designer's Guide to Human Performance Modelling; December 1998, pp. A8-1 - A8-21; In English; See also 19990032479; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

WinCrew is a tool for constructing system performance models for existing or conceptual systems when a central issue is whether the humans and machine will be able to handle the workload. WinCrew can be used to predict operator workload for a crew given a design concept. WinCrew also has the ability to model and predict the effects of that workload on crew and system

performance. What separates WinCrew from other workload models is this direct link between task-induced workload and the effect on system performance. With WinCrew, you can predict how the human will dynamically alter his behaviour when he or she encounters high workload situations. WinCrew can simulate the following as a function of high workload: dynamic allocation of tasks between humans, machines; dropping tasks based on task priority; and task time and accuracy degradation.

Derived from text

*Human Performance; Performance Prediction; Workloads (Psychophysiology); Man Machine Systems; Dynamic Models; Systems Engineering; System Effectiveness*

**19990032489** NASA Ames Research Center, Moffett Field, CA USA

**Man-Machine Integrated Design and Analysis System (MIDAS): Functional Overview**

Corker, Kevin, NASA Ames Research Center, USA; Neukom, Christian, NASA Ames Research Center, USA; A Designer's Guide to Human Performance Modelling; December 1998, pp. A9-1 - A9-15; In English; See also 19990032479; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

Included in the series of screen print-outs illustrates the structure and function of the Man-Machine Integrated Design and Analysis System (MIDAS). Views into the use of the system and editors are featured. The use-case in this set of graphs includes the development of a simulation scenario.

Derived from text

*Man Machine Systems; Computerized Simulation; Systems Engineering; Systems Simulation; Systems Integration; Systems Analysis*

**19990032490** Advisory Group for Aerospace Research and Development, Human Performance Modelling Working Group, Neuilly-Sur-Seine, France

**Appendix B: Weightings and Ratings Matrices**

A Designer's Guide to Human Performance Modelling; December 1998, pp. B1 - B-12; In English; See also 19990032479; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This appendix contains the matrices used to define the weightings and ratings of the models implemented in the HOMER Expert System. It also contains examples of two completed tables. B1 contains models contained in HOMER Version I, B2 contains HOMER assessment of model capabilities - MIDAS, and B3 contains HOMER assessment of model capabilities - ORACLE.

Derived from text

*Expert Systems; Assessments; Evaluation*

**19990035996** Naval Research Lab., Washington, DC USA

**Optical Emission Studies of the NRL Plasma Torch for the Shipboard Waste Treatment Program**

Giuliani, J. L.; Counts, D. A.; Rogerson, J.; Clark, R. W.; Kepple, P.; Feb. 26, 1999; 30p; In English  
Report No.(s): AD-A360841; NRL/MR/6720-99-8328; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Optical emission spectroscopy is employed to characterize the plasma in the NRL torch operating at approx. 100 kW DC power. Both non-transferred and transferred arc configurations are considered. The working gas of the torch is nitrogen with a 5% admixture of hydrogen. Atomic emission lines are measured and analyzed using a local thermodynamic equilibrium (LTE) and a collisional radiative equilibrium (CRE) model. The core of the arc is found to be close to LTE, with a central plasma temperature of 6,200 deg K in the non-transferred mode, and approx. 15,000 deg K in the transferred mode. However, the periphery of the arc is far from thermal and excitation equilibrium. Radiative photo-pumping by the hot core, included in the CRE model, is found to play a significant role in controlling excited level populations. Stark broadened H sub Beta measurements of the non-transferred arc indicate an anomalously high electron density. For the transferred arc the plasma radiation accounts for approx. 50% of the energy input to the plasma. Finally, the electrical properties of long transferred arcs are found to change during slag processing due to entrainment of volatilized slag material with low ionization potential. This suggests an on-line diagnostic for the process state of the treated waste.

DTIC

*Emission Spectra; Plasma Torches; Waste Treatment; Optical Emission Spectroscopy; Plasmas (Physics)*

**19990036747** Army Aeromedical Research Lab., Fort Rucker, AL USA

**Female Hairstyle and Flight Helmet Accommodation: The AMELIA Project. Phase1: Survey Study. Part 2: Survey Responses Final Report**

McEntire, B. J.; Murphy, Barbara A.; Mozo, Ben T.; Mar. 1999; 82p; In English  
Contract(s)/Grant(s): Proj-30162787A878



Report No.(s): AD-A361528; USAARL-99-10; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Most personal protective equipment in current military aviation was designed with male aircrew in mind. to ensure that female aviator performance is not hampered by improperly fitted or sized equipment, the U.S. Navy (USN) established the Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) program. In this Phase 1 study, a novel questionnaire was distributed to a variety of USN and U.S. Marine Corps (USMC) aviation installations around the world to assess the effect of female hairstyles on flight helmet performance and safety. One hundred and one completed questionnaires were returned to the U.S. Army Aeromedical Research Laboratory (USARRL) resulting in a response rate of 21-40%.

DTIC

*Aircraft Pilots; Females; Flight Characteristics; Flight Crews; Helmets*

**19990036748** Army Aeromedical Research Lab., Fort Rucker, AL USA

**Female Hairstyle and Flight Helmet Accommodation: The AMELIA Project. Phase I: Survey Study. Part 1: Research Report Final Report**

McEntire, B. J.; Murphy, Barbara A.; Mozo, Ben T.; Crowley, John S.; Mar. 1999; 54p; In English

Contract(s)/Grant(s): Proj-30162787A878

Report No.(s): AD-A361529; USAARL-99-09; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Most personal protective equipment in current military aviation was designed with male aircrew in mind. to ensure that female aviator performance is not hampered by improperly fitted or sized equipment, the U.S. Navy (USN) established the Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) program. In this Phase I study, a novel questionnaire was distributed to a variety of USN and U.S. Marine Corps (USMC) aviation installations around the world to assess the effect of female hairstyles on flight helmet performance and safety. One hundred and one completed questionnaires were returned to the U.S. Army Aeromedical Research Laboratory (USAARL) resulting in a response rate of 21-40%.

DTIC

*Females; Helmets; Flight Crews; Flight Characteristics*

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